

PAST AND PRESENT DISTRIBUTIONS AND TRANSLOCATIONS OF MACQUARIE PERCH *Macquaria australasica* (PISCES: PERCICHTHYIDAE), WITH PARTICULAR REFERENCE TO VICTORIA

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ABSTRACT: Details of past and present distributions and translocations of Macquarie perch in Victoria are presented. Prior to 1970 the species was recorded at 52 localities within its natural geographical range, in the Murray-Darling River system. Since 1970 it has been recorded at only 20 of these localities. Of the waters which are outside its natural range and into which it has been released, Macquarie perch has been taken in only three since 1970 and in only one with any regularity. In most waters, both within and outside its natural range, only relict populations remain. Siltation has probably been the main cause of the decline in range and abundance of the species in Victoria, but several other factors, including the construction of dams and weirs, interaction with introduced fish, overfishing, "river improvement" and local pollution, have probably all contributed to its demise. Data on the distribution of Macquarie perch outside Victoria are summarised.

INTRODUCTION

Past and present distribution patterns of Australian native freshwater fish are poorly documented. In addition, transfers of fish from one catchment to another often went unrecorded, thereby causing confusion for taxonomists who now try to elucidate the relationships between the various stocks of a species. However, there are more records for distributions of commercial or sporting fish than for many of the smaller species. In this paper, I have summarised data on past and present (post 1970) distributions and translocations of Macquarie perch, *Macquaria australasica* Cuvier and Valenciennes (Pisces: Percichthyidae), a native freshwater sport fish whose survival is now seriously threatened (Llewellyn & MacDonald 1980). Although I include some data on the distribution of the species outside Victoria, most of the information presented relates to the status of Macquarie perch in Victoria. Such information is a necessary prerequisite in any attempt to determine the factors responsible for the decline or elimination of Macquarie perch from specific areas and also as a basis for planning the release of hatchery-produced fish in the future.

METHODS

Information on the distribution of Macquarie perch was obtained from the following published works: Stead (1913), McKeown (1934), Butcher (1946), Whitley (1964), Roughley (1966), Lake (1967, 1971, 1978), Wharton (1968, 1973), Anon. (1973, 1974), Scott *et al.* (1974), Tunbridge & Rogan (1976), Cadwallader (1977, 1979), Cadwallader & Rogan (1977), Hungerford (1977), Wedlick (1977), Bishop & Bell (1978), Bishop & Tilzey (1978), Tunbridge (1978), Cadwallader & Eden (1979), Pratt (1979), and Llewellyn & MacDonald (1980), and from the records of the Victorian Piscatorial Council (V.P.C.), the Ballarat Fish Acclimatisation Society and the Fisheries and Wildlife Division of the Ministry for Conservation. The last source included the unpublished

results of several fish surveys and an old manuscript entitled "Particulars of stocking streams with Murray perch, English perch and English tench, etc." covering the period 1909-1955. Information was also received in response to a circular distributed to angling clubs and to Fisheries and Wildlife officers throughout Victoria, and from general contact and correspondence with anglers in particular areas.

In addition, many Victorian waters known to have contained Macquarie perch in the past were surveyed by the author between 1975 and 1980, and by other Fisheries and Wildlife Division staff during routine survey work, particularly in relation to management of the trout fishery.

RESULTS

DISTRIBUTION OF MACQUARIE PERCH IN VICTORIA

The past and present distributions of Macquarie perch in Victoria are shown in Fig. 1. The natural geographical range of the species is confined to the Murray-Darling River system, north of the Great Divide, and this range is now much less than in the past (cf. open circles and solid circles in Fig. 1). There have been many recorded translocations of Macquarie perch both within and outside this natural range (Table 1) and the present status (post 1970) of Macquarie perch in the waters into which they have been introduced is indicated in Fig. 1 (cf. open squares and solid squares). In addition, there have been several transfers of Macquarie perch from natural waters to farm dams within the same catchment; details of these transfers are not included in this paper.

Several of the earliest records of translocations refer to "Murray perch", which probably included Macquarie perch as well as golden perch *Macquaria ambigua* (Richardson) and perhaps also silver perch *Bidyanus bidyanus* (Mitchell), although the last species was usually distinguished by the term "grunter". The terms "Murray bream" and "Goulburn bream" also occur in the early



records; "bream" is the common name for Macquarie perch in some areas, but in other areas may also have applied to silver perch. Some of the early records of translocations of "Murray perch" are qualified by the term "of the Macquarie variety" (e.g. Table 1: the 1910 releases into the Yarra River) and several early records (from 1913 onwards) for the Yarra River refer to "Macquarie perch" being caught by anglers after earlier releases of "Murray perch". In the records of a series of translocations of "Macquarie perch" taken from the Goulburn Weir in 1922 (see Table 1), the consignments were reported to include small proportions of golden perch (about 5%) and silver perch (about 2.5%). Thus, although the species composition of the earliest translocations of "Murray perch" is in doubt, Macquarie perch probably formed the bulk of the fish, particularly of those fish taken in the Goulburn River catchment (from the Goulburn River itself, the Goulburn Weir or Broken River) from where many later batches of "Macquarie perch" were taken.

Fig. 1—Past and present distributions of Macquarie perch in Victoria. The grey shaded area indicates the presumed past distribution of Macquarie perch; ●, natural population still (post 1970) present; ○, natural population no longer present; ■, population derived from introduced fish, still present; □, introduced but no longer present. Key to locality numbers: 1, River Murray (Tom Groggin); 2, Berringham Creek; 3, Dartmouth Dam and inflowing waters; 4, Mitta Mitta River; 5, Lake Hume; 6, Kiewa River; 7, Lake Sambell; 8, Buckland River; 9, Lake Buffalo; 10, Buffalo River; 11, King River; 12, Meadow Creek; 13, Ovens River; 14, River Murray (Burramine); 15, River Murray (Tocumwal); 16, River Murray (Barmah); 17, Boosey Creek; 18, Broken Creek; 19, Lake Nillaheootie; 20, Broken River; 21, Stony Creek; 22, Honeysuckle Creek; 23, Seven Creeks (upper reaches); 24, Faithfuls Creek; 25, Seven Creeks (lower reaches); 26, Hughes Creek (upper reaches); 27, Hughes Creek (lower reaches); 28, Sunday Creek; 29, Sirath Creek; 30, King Parrot Creek; 31, Yea River; 32, Murrindindi River; 33, Home Creek; 34, Lake Eildon and inflowing rivers; 35, Goulburn River (Thornton); 36, Goulburn River (Cathkin); 37, Goulburn River (Seymour-Kerrisdale); 38, Goulburn River (Tabilk-Goulburn Weir); 39, Goulburn River (Shepparton); 40, Lake Victoria; 41, River Murray (Echuca); 42, Campaspe River; 43, Axe Creek; 44, Coliban River; 45, River Murray (Torrumbarry); 46, Loddon River; 47, Laanecoorie Reservoir; 48, Bet Bet Creek; 49, Deep Creek (= Tullaroop Creek); 50, Lake Daylesford; 51, River Murray (Swan Hill); 52, River Murray (Euston); 53, Avoca River; 54, Wimmera River; 55, Burnt Creek; 56, Marma Lake; 57, Taylors Lake; 58, Richardson River; 59, Mokepilly Creek; 60, Glenelg River; 61, Wannon River; 62, Grange Burn; 63, Hopkins River; 64, Mt. Emu Creek; 65, dam at Mortlake; 66, Lake Wendouree; 67, Moorabool River; 68, Barwon River; 69, Werribee River; 70, Kororoit Creek; 71, Middle Gully Creek; 72, Deep Creek; 73, Plenty River; 74, Yarra River; 75, La Trobe River; 76, dam at Cheltenham; 77, dam at Bayswater; 78, dam at Ringwood; 79, Edwardes Lake, Preston; 80, dam at Greenvale; 81, Coburg Lake; 82, Fish Hatchery at Studley Park.

DISTRIBUTION OF MACQUARIE PERCH OUTSIDE VICTORIA

Whitley (1964) mentioned that Macquarie perch occurred in the upper reaches of the Murray-Darling River system in southern Queensland, New South Wales, Victoria and South Australia and some eastern streams of New South Wales. However, there are no corroborative reports of Macquarie perch occurring in southern Queensland, and the occurrence of Macquarie perch in South Australia is based on one doubtful record from the Murray River (Scott *et al.* 1974). Reports of their occurrence in the River Murray upstream of the South Australian border have been incorporated into the distribution data for Victoria. Macquarie perch have also been recorded from the Edwards (or Kyalite) River; Wakool River; Wyangala Reservoir on the Lachlan River and in the Lachlan and Abercrombie Rivers upstream of the Reservoir. In the Murrumbidgee River catchment, they have been taken at Narrandera, Wagga Wagga and just below Burrinjuck Dam on the Murrumbidgee River itself; in Burrinjuck Dam and the Yass and Goodradigbee Rivers that enter it; near Tantangara Dam in the headwaters of the Murrumbidgee River; in the Cotter River system and the Cotter Reservoir; in Googong Reservoir and the Queanbeyan River that flows into it, and in the lower reaches of the Umeralla River. Macquarie perch have also been recorded in several coastal rivers and their tributaries in New South Wales, including the Hunter River; Gross River and Nepean River (Hawkesbury River catchment); Kangaroo River, Mongarlowe River, Northangara Creek and Tallowa Dam Impoundment (Shoalhaven River catchment); Clyde River; and Warnambool River (Turoos River catchment); and in several Sydney water supply dams such as the Avon Reservoir.

Stead (1913) mentioned that the Macquarie perch occurring in the Shoalhaven, Hawkesbury and Hunter Rivers and "probably a number of others farther north" were of a smaller variety than those occurring in the Murray-Darling system. At present, the Macquarie perch in these coastal rivers are generally thought to have been introduced (by either Aboriginal or European man) from stocks occurring west of the Great Dividing Range, in the Murray-Darling River system, but there are no records of Macquarie perch having been transferred to these rivers (Bishop & Tilzey 1978). This is in contrast to the detailed description given by Stead (1913) of the transfer in 1912 of 414 Macquarie perch, ranging in length from 76 mm to 229 mm, from the upper reaches of the Murrumbidgee River near Cooma to the Snowy River near Dalgety.

According to Bishop & Tilzey (1978) the numbers of Macquarie perch in the Murray-Darling system in New South Wales appear to have been drastically reduced during the last 20 years, as also have the numbers of Macquarie perch in the Mongarlowe River. Pratt (1979) reports a similar decline in the numbers of Macquarie perch in the Canberra region, where the Macquarie perch populations are now small and localised.

TABLE 1

KNOWN TRANSLOCATIONS OF MACQUARIE PERCH IN VICTORIA

See text for further details and discussion of the terms "Murray perch" and "bream", etc.

Release locality				Source locality		
Name of water	Ref. No. (see Fig. 1)	Catchment	Date	Name of water	Ref. No. (see Fig. 1)	Catchment
<i>A. Translocations within the natural geographical range of Macquarie perch</i>						
Bet Bet Creek	48	Loddon River	1930	Goulburn Weir	38	Goulburn River
Boosey Creek	17	Broken Creek	1917	Not recorded	—	—
			1962	Broken River	20	Goulburn River
Coliban River	44	Campaspe River	1936	Broken River	20	Goulburn River
			1962	Broken River	20	Goulburn River
Lake Daylesford	50	Loddon River	1931	Goulburn Weir	38	Goulburn River
Deep Creek	49	Loddon River	1930	Goulburn Weir	38	Goulburn River
(= Fullaroop Creek)						
Faithfuls Creek	24	Goulburn River	1922	Stony Creek	21	Goulburn River
Honeysuckle Creek	22	Goulburn River	1937	Broken River	20	Goulburn River
Hughes Creek	26	Goulburn River	1922	Goulburn Weir	38	Goulburn River
(upper reaches)						
			1980	Dartmouth Dam	3	Mitta Mitta River
Meadow Creek	12	Ovens River	1973	Seven Creeks	23	Goulburn River
Lake Sambell	7	Ovens River	1928	Ovens River	13	Ovens River
Seven Creeks	23	Goulburn River	1921	Goulburn River	36	Goulburn River
(upper reaches)						
			1921	Seven Creeks (lower reaches)	25	Goulburn River
			1922	Goulburn River	36	Goulburn River
Sunday Creek	28	Goulburn River	1917	not recorded	—	—
Lake Victoria	40	Goulburn River	1937	not recorded	—	—
			1937	Broken River	20	Goulburn River
<i>B. Translocations to outside the natural geographical range of Macquarie perch</i>						
Avoca River	53	Avoca River	1927	Goulburn Weir	38	Goulburn River
Barwon River	68	Barwon River	1931	Lake Eildon	34	Goulburn River
			1935	Broken River	20	Goulburn River
			1938	not recorded	—	—
Burnt Creek	55	Wimmera River	1920	not recorded	—	—
Deep Creek	72	Maribyrnong River	1917	not recorded	—	—
Glenelg River	60	Glenelg River	1930	Goulburn Weir	38	Goulburn River
Grange Burn	62	Glenelg River	1922	Goulburn Weir	38	Goulburn River
			1926	Goulburn Weir	38	Goulburn River
Hopkins River	63	Hopkins River	1913	not recorded	—	—
Kororoit Creek	70	Kororoit Creek	1912	not recorded	—	—
La Trobe River	75	La Trobe River	1927	Goulburn Weir	38	Goulburn River
Marna Lake	56	Wimmera River	1922	Goulburn Weir	38	Goulburn River
Middle Gully Creek	71	Maribyrnong River	1926	Goulburn Weir	38	Goulburn River
(= Riddells Creek)						
Mokeypilly Creek	59	Wimmera River	1913	not recorded	—	—
Moorabool River	67	Barwon River	1935	Broken River	20	Goulburn River
Mortlake, dam	65	Hopkins River	1920	not recorded	—	—
Mt. Emu Creek	64	Hopkins River	1920	not recorded	—	—
			1922	Goulburn Weir	38	Goulburn River
			1926	Goulburn Weir	38	Goulburn River
Plenty River	73	Yarra River	1912	not recorded	—	—
Richardson River	58	Wimmera River	1910	Goulburn Weir	38	Goulburn River
Taylors Lake	57	Wimmera River	1933	Wakool River	NSW	Murray River
			1935	not recorded	—	—
Wannon River	61	Glenelg River	1917	not recorded	—	—
			1920	not recorded	—	—
			1922	Goulburn Weir	38	Goulburn River

TABLE 1 (Continued)

Remarks
19 Nov.; 200 Macquarie perch released in Deep and Bet Bet Creeks at Maryborough.
200 Murray perch released in Boosey Creek at Tungamah.
50-100 small Macquarie perch released.
400 Macquarie perch netted near Nalinga on the Broken River released in the Coliban River downstream of Malmesbury Reservoir.
Macquarie perch taken in order to stock the Coliban and Campaspe arms of Lake Eppalock. Considered to be insufficient fish for a release the wild, so the fish were stocked in farm dams in the Coliban-Campaspe catchment.
29 Jan.; 146 Macquarie perch released.
19 Nov.; 200 Macquarie perch released in Deep and Bet Bet Creeks at Maryborough.
300 small Macquarie perch released in the upper reaches of Faithfuls Creek.
Feb.; 200 Macquarie perch, average length 150 mm, released.
"18 tins" of cod, bream and golden perch taken to the Ruffy area and released in local waters.
6 Feb.; 32 Macquarie perch, TL range 215-390 mm and weight range 100-600 g, released in upper reaches of Hughes Creek.
15 Nov.; 28 Macquarie perch, 115-230 mm long, from the upper reaches of the Seven Creeks system released.
50 Macquarie perch, 150-400 mm long, released.
45 Macquarie perch taken at Cathkin on the Goulburn River released near Strathbogie above the Gooram Falls in the upper reaches of the Seven Creeks system.
About 50 small cod and Macquarie perch were taken in the Seven Creeks system below the Gooram Falls and released upstream Strathbogie.
167 Macquarie perch taken at Cathkin on the Goulburn River released near Strathbogie in the upper reaches of the Seven Creeks system.
Jan.; 200 Murray perch released in Sunday Creek at Broadford.
Oct.; 20 Macquarie perch released in Lake Victoria, Shepparton.
Nov.; 33 Macquarie perch released.
8 Nov.; 128 Macquarie perch released. 16 Nov.; 250 Macquarie perch released.
14 May; 80 Macquarie perch released in the Barwon River at Princes Bridge near Geelong.
April; 930 perch fry, lengths 60-215 mm, released in the Barwon and Moorabool Rivers.
April; 808 Macquarie perch released.
Dec.; 200 Murray perch, average length 150 mm, released in Burnt Creek near Horsham.
Jan.; 200 Murray perch released in Deep Creek at Romsey.
20 Nov.; 210 Macquarie perch released in Glenelg River at Casterton.
Feb.; 200 Macquarie perch, weight range 60-680 g, released in Wannon River and Grange Burn near Hamilton.
Nov.; 200 Murray perch released in Wannon River and Grange Burn near Hamilton.
Dec.; 100 Murray perch released in Hopkins River at Ararat.
50 Murray perch released in Kororoit Creek, Melbourne.
9-12 Nov.; 1072 Macquarie perch released in La Trobe River at Traralgon.
Feb.; 230 Macquarie perch, weight range 60-680 g, released in Marma Lake, Murtoa.
Nov.; 300 Murray perch released in Middle Gully Creek and Reservoir, Macedon.
Dec.; 100 Murray perch released in Mokepilly Creek at Stawell.
April; 930 perch fry, lengths 60-215 mm, released in the Barwon and Moorabool Rivers.
Dec.; 100 Murray perch, average length 150 mm, released in dam at Mortlake.
Dec.; 200 Murray perch, average length 150 mm, released in Emu Creek (sic), Skipton.
Feb.; 320 Macquarie perch, from 60 to 680 g, released in Emu Creek (sic), Skipton.
Nov.; 200 Murray perch released in Emu Creek (sic), Skipton.
100 Murray perch released in Plenty River, south Yan Yean.
Nov.-Dec.; 454 Murray perch released in Richardson River at Donald; length and weight ranges of 18 tagged fish; 115-200 mm, 30-130 g.
April; 88 cod and perch released.
Jan.; 50 cod and perch, lengths 250-460 mm, released.
Dec.; 400 Murray perch released in Wannon River near Hamilton.
Feb.; 375 Macquarie perch, from 60 to 680 g, released in Wannon River at Coleraine, and a further 200 of the same size range released in Wannon River and Grange Burn, Hamilton.

TABLE 1 (Continued)

Release locality			Source locality			
Name of water	Ref. No. (see Fig. 1)	Catchment	Date	Name of water	Ref. No. (See Fig. 1)	Catchment
Lake Wendouree	66	Barwon River	1926	Goulburn Weir	38	Goulburn River
			1927	Goulburn Weir	38	Goulburn River
			1910	Goulburn Weir	38	Goulburn River
			1920	not recorded	—	—
			1922	Goulburn Weir	38	Goulburn River
Werribee River	69	Werribee River	1926	Goulburn Weir	38	Goulburn River
			1930	Goulburn River	38	Goulburn River
Wimmera River	54	Wimmera River	1910	Goulburn Weir	38	Goulburn River
			1920	not recorded	—	—
			1922	Goulburn Weir	38	Goulburn River
			1926	Goulburn Weir	38	Goulburn River
			1938	Murray River	?	Murray River
(?)			1948	Kyalite River	NSW	Murray River
			1949	Broken River	20	Goulburn River
			1950	Broken River	20	Goulburn River
			1907/8	Goulburn River	38	Goulburn River
			1909	Goulburn Weir	38	Goulburn River
			1910	Goulburn Weir	38	Goulburn River
			1911	not recorded	—	—
			1912	not recorded	—	—
			1914	not recorded	—	—
			1915	not recorded	—	—
			1917	not recorded	—	—
			1920	not recorded	—	—
			1926	Goulburn Weir	38	Goulburn River
			1927	Goulburn Weir	38	Goulburn River
			1930	Goulburn River	38	Goulburn River
			1931	Goulburn River	38	Goulburn River
			1932	Goulburn River	38	Goulburn River
			1933	Goulburn River	37	Goulburn River
			1934	Goulburn River	?	Goulburn River
			1938	Broken River	20	Goulburn River
			1943	Broken River	20	Goulburn River
			Miscellaneous lakes and ponds in or near Melbourne			
dam, Cheltenham	76	sea	1915	not recorded	—	—
dam, Greenvale	80	Yarra River	1915	not recorded	—	—
dam, Ringwood	78	Yarra R. or				
		Dandenong Ck.	1920	not recorded	—	—
Edwardes Lake, Preston	79	Yarra River	1922	Goulburn Weir	38	Goulburn River
dam, Bayswater	77	Dandenong Creek	1922	Goulburn Weir	38	Goulburn River
Coburg Lake	81	Yarra River	1922	Goulburn Weir	38	Goulburn River
fish hatchery, Studley Park	82	Yarra River	1922	Goulburn Weir	38	Goulburn River
			1927	Goulburn Weir	38	Goulburn River

DISCUSSION

In their natural geographical range in Victoria, Macquarie perch have, during the last decade, been recorded at only 20 of the 52 localities where they had previously been recorded. Of these 20 localities, three (Meadow Creek and the upper reaches of both Hughes and Seven Creeks) are waters into which they were introduced from elsewhere within their natural range. Of the waters outside their natural range which have been stocked, only in three (Wannon, Barwon and Yarra Rivers) have Mac-

quarie perch been taken since 1970, and only in the Yarra with any regularity. In most waters, both within and outside the natural range, only relict populations remain, with recent surveys recording only a few fish, in most cases often only single individuals, and anglers' reports similarly referring to the capture of only a few or single individuals. At present the largest population of Macquarie perch in Victoria is in the newly-formed Lake Dartmouth on the Mitta Mitta River. In the Goulburn River catchment there are several isolated populations,

TABLE 1 (Continued)

Remarks

Nov.; 200 Murray perch released in Grange Burn and Wannon River at Hamilton.
21 Nov.; 264 Macquarie perch released in Wannon River at Hamilton.
Nov.-Dec.; 494 Murray perch released in Lake Wendouree, Ballarat; length and weight ranges of 26 tagged fish: 100-220 mm, 14-140 g.
400 Murray perch, average length 150 mm, released in Melton Weir on Werribee River.
Feb.; 1575 Macquarie perch, from 60 to 680 g, released in Melton Weir on Werribee River.
Nov.; 110 Murray perch released in Melton Reservoir on Werribee River.
19 April; 120 Macquarie perch taken at Tabilk released in Werribee River below the Exford Weir.
Nov.-Dec.; 250 Murray perch released in Wimmera River at Horsham.
Dec.; 300 Murray perch, average length 150 mm, released in Wimmera River at Horsham.
Feb.; 450 Macquarie perch, from 60 to 680 g, released near Horsham (no waters mentioned).
Nov.; 350 Murray perch released in Wimmera River at Horsham.
April; 38 cod and Macquarie perch released in Wimmera River.
60 Macquarie perch and Murray cod released in Wimmera River.
July; 158 Macquarie perch released in Wimmera River at Eversley.
April; 156 Macquarie perch released in Wimmera River at Eversley.
500 Murray bream and perch from Tabilk released in Yarra River between Abbotsford and Heidelberg to supplement fish which had previously been introduced there.
Oct.-Nov.; 975 perch and bream released between Studley Park and Heidelberg; length and weight ranges of 48 tagged fish: 135-215 mm, 60-185 g.
Nov.-Dec.; 4431 Murray perch ("of the Macquarie variety" - V.P.C. records) released above Dights Falls (3100 fish), at Swan Street Bridge (1000 fish) and at Fairfield (575); length and weight ranges of 97 tagged fish: 100-255 mm, 14-215 g.
9-13 Nov.; 1000 Murray perch released above Dights Falls (400 fish), at Swan Street Bridge (400) and at Johnston Street (200).
1700 Murray perch released at Johnston Street.
Nov.; 100 Murray perch released at Fairfield.
Nov.-Dec.; 4325 Murray perch released at Studley Park.
Jan.; 4100 Murray perch released at Richmond.
Dec.; 2200 Murray perch, average length 150 mm, released at Swan Street Bridge (500 fish) and Studley Park (1700).
Nov.; 290 Murray perch released at Fairfield.
Macquarie perch released above falls (Dights ?): 500 on 14-15 Nov., 150 on 17 Nov. and 382 on 24 Nov.
April; 345 Macquarie perch, about 150 mm long, taken at Tabilk released in Yarra River between Dights Falls and Alphonington.
12 March; 16 Macquarie perch taken at Tabilk released in Yarra River.
18 March; 54 Macquarie perch taken at Tabilk released at Heidelberg.
20 March; 24 Macquarie perch, 100-240 mm long, taken at Kerrisdale released at Fairfield.
14 Macquarie perch released near Burke Road Bridge.
208 Macquarie perch released at Warrandyte.
40 cod and perch released at Warrandyte.
Nov.-Dec.; 7 Murray perch and 2 grunners released.
Nov.-Dec.; 5 Murray perch and 2 grunners released.
Dec.; 200 Murray perch, average length 150 mm, released.
Feb.; 80 Macquarie perch, from 60 to 680 g, released.
Feb.; 50 Macquarie perch, from 60 to 680 g, released.
Feb.; 50 Macquarie perch, from 60 to 680 g, released.
15 Feb.; 20 Macquarie perch, from 450 to 910 g, placed in ponds at the hatchery.
"11 cans" of Macquarie perch sent to hatchery.

but only at one or two localities, Hughes Creek and the upper reaches of the Seven Creeks system, can the populations be considered viable. The population in the upper reaches of the Seven Creeks system was derived from fish liberated in the area in 1921-22 and has persisted, whereas the natural population of Macquarie perch in the lower reaches has been almost eliminated probably as a result of siltation (Cadwallader 1979).

Siltation has probably been the most important factor in the decline of Macquarie perch in Victoria (Cad-

wallader 1978). Although they may thrive in artificial impoundments, Macquarie perch naturally are riverine fish and are normally found in deep holes, but require shallow water flowing over a gravel-pebble-boulder substrate for spawning (Wharton 1968, Cadwallader & Rogan 1977). Silt, by filling the deep holes, destroys Macquarie perch habitat and, by settling on the river bed, provides conditions unfavourable for the demersal eggs of Macquarie perch. It also affects the composition of the benthic fauna which forms the main component

of the diet of Macquarie perch (Cadwallader & Eden 1979). Significantly, most of today's riverine populations of Macquarie perch are in the upper reaches of catchments where siltation loads are not heavy and where there are still deep holes interspersed with shallow riffles.

The construction of dams and weirs for hydro-electric, irrigation and water conservation schemes has also played a role in the decline of Macquarie perch. Dams prevent Macquarie perch from moving upstream (see Appendix 3 in Cadwallader 1977). Moreover, since no dam in Victoria (including those on the River Murray adjoining Victoria) is fitted with multi-level water offtakes, water released downstream is taken from near the base of the water column and is too cold (e.g. 9°C from Lake Eildon) to induce spawning of Macquarie perch, which require a temperature threshold of 16.5°C for spawning during late spring-early summer (Wharton 1968, Cadwallader & Rogan 1977).

Interaction (including competition and predation) with introduced fish is another factor to be considered in the decline of Macquarie perch. For example, although the evidence is circumstantial, the European perch *Perca fluviatilis* (Linnaeus) has been implicated in the decline of Macquarie perch in Lake Eildon (Cadwallader & Rogan 1977). Various other factors, such as overfishing, "river improvement" and pollution (particularly that arising from spraying crops along river banks), have also probably contributed to the decline of Macquarie perch in some areas, but, again, no studies have been undertaken to examine the role of these factors in the decline of Macquarie perch.

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